FIG.1

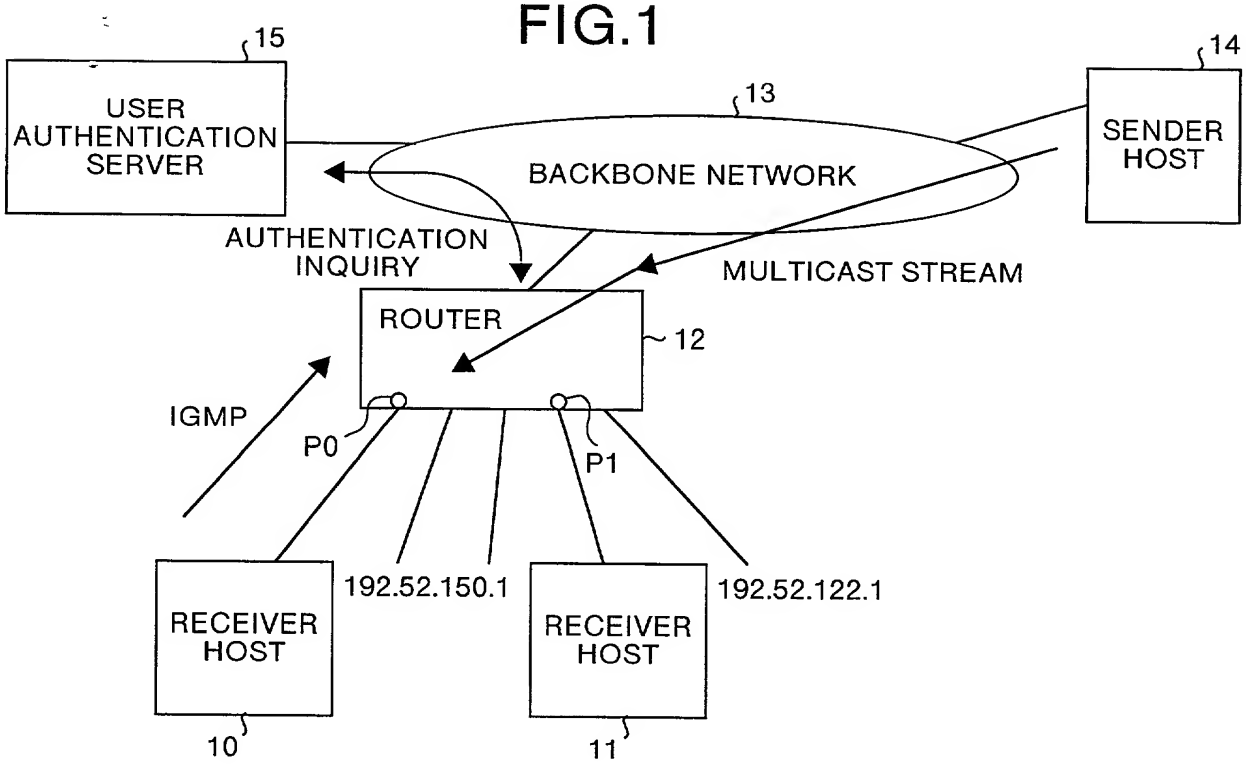


FIG.2

MULTICAST RECEIVER AUTHENTICATION TABLE

RECEIVER IP ADDRESS	GROUP ADDRESS	PE ROUTER IP ADDRESS	PE ROUTER PORT NUMBER
192.52.150.1	224.1.1.1	220.0.0.1	1
192.52.122.1	NONE (ALL ACCEPTED)	220.0.0.2	6

FIG.3

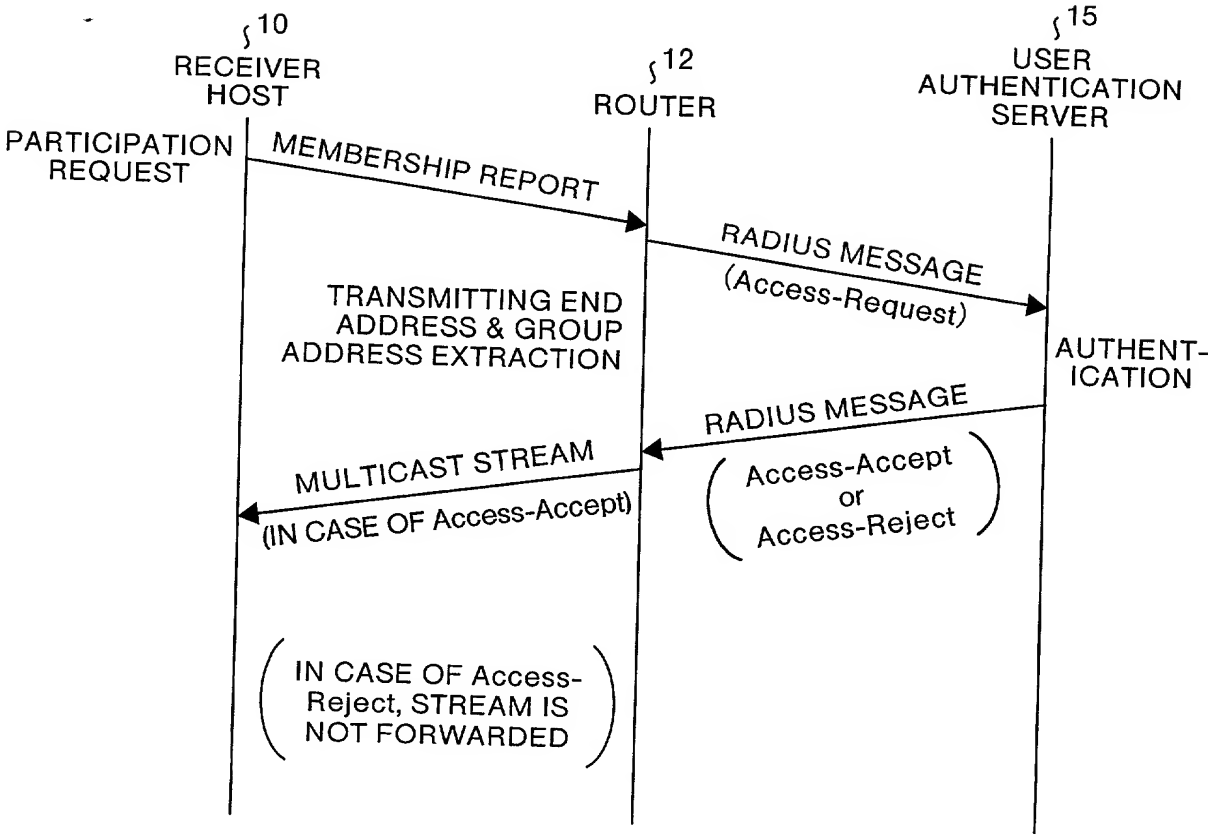

10
RECEIVER HOST
12
ROUTER
15
USER AUTHENTICATION SERVER
PARTICIPATION REQUEST
MEMBERSHIP REPORT
RADIUS MESSAGE
(Access-Request)
TRANSMITTING END ADDRESS & GROUP ADDRESS EXTRACTION
AUTHENT-ICATION
RADIUS MESSAGE
MULTICAST STREAM
(IN CASE OF Access-Accept)
Access-Accept or Access-Reject
IN CASE OF Access-Reject, STREAM IS NOT FORWARDED

FIG.4

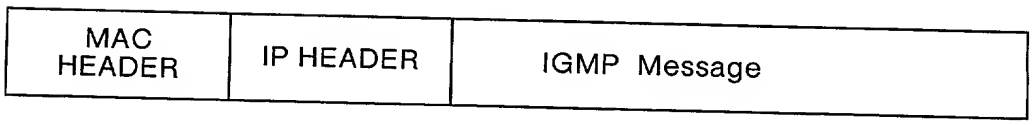

MAC HEADER
IP HEADER
IGMP Message

FIG.5

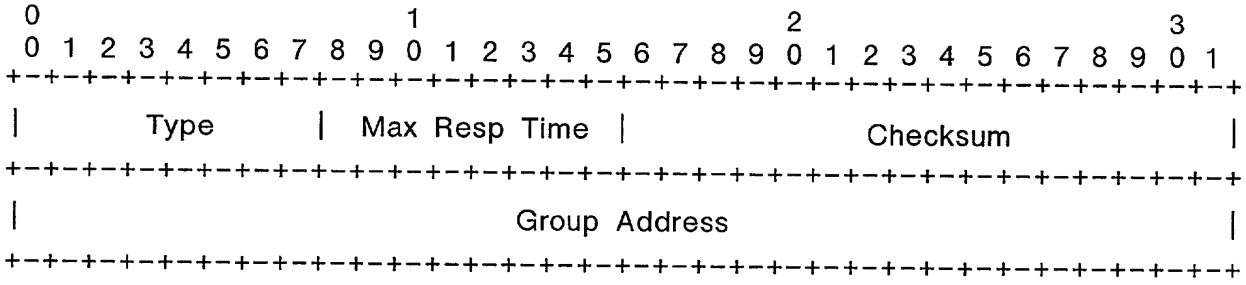
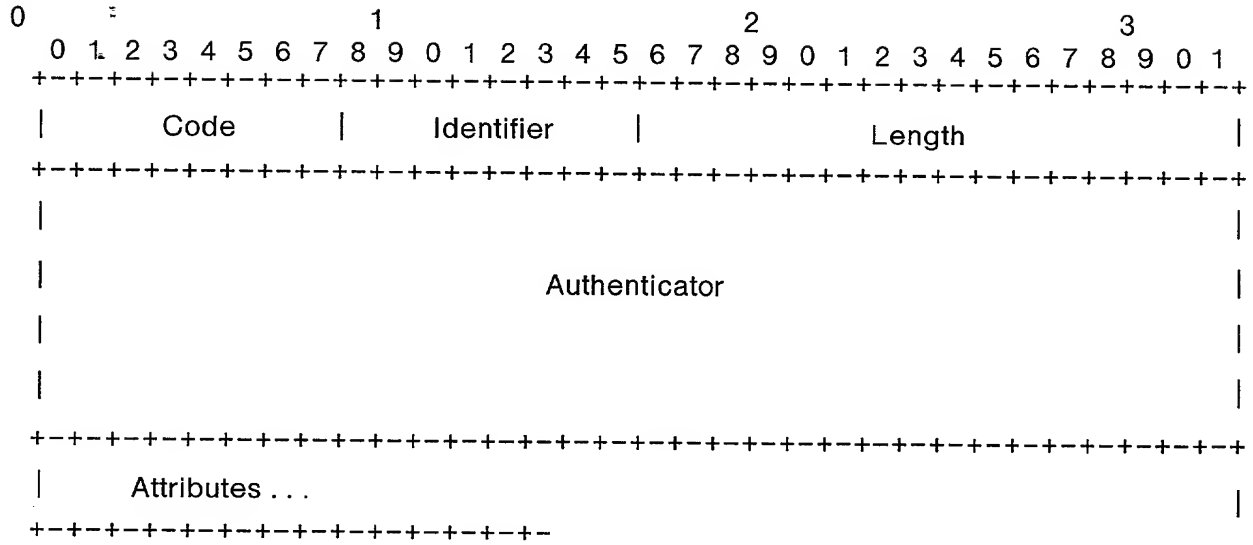

0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
Type
Max Resp Time
Checksum
Group Address

FIG.6


MAC HEADER
IP HEADER
UDP HEADER
RADIUS Message

FIG.7

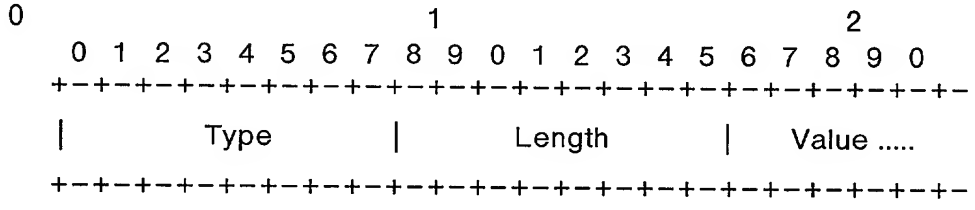


Code :

1 Access-Request
2 Access-Accept
3 Access-Reject
4 Accounting-Request
5 Accounting-Response

Identifier : ID IDENTIFYING MESSAGE
Length : MESSAGE LENGTH
Authenticator : DATA RECOGNIZING MESSAGE
Attributes : ATTRIBUTE VALUE

FIG.8



Type

1 User-Name
2 User-Password
4 NAS-IP-Address
5 NAS-Port

223 Multicast-Time-Start
224 Multicast-Time-End

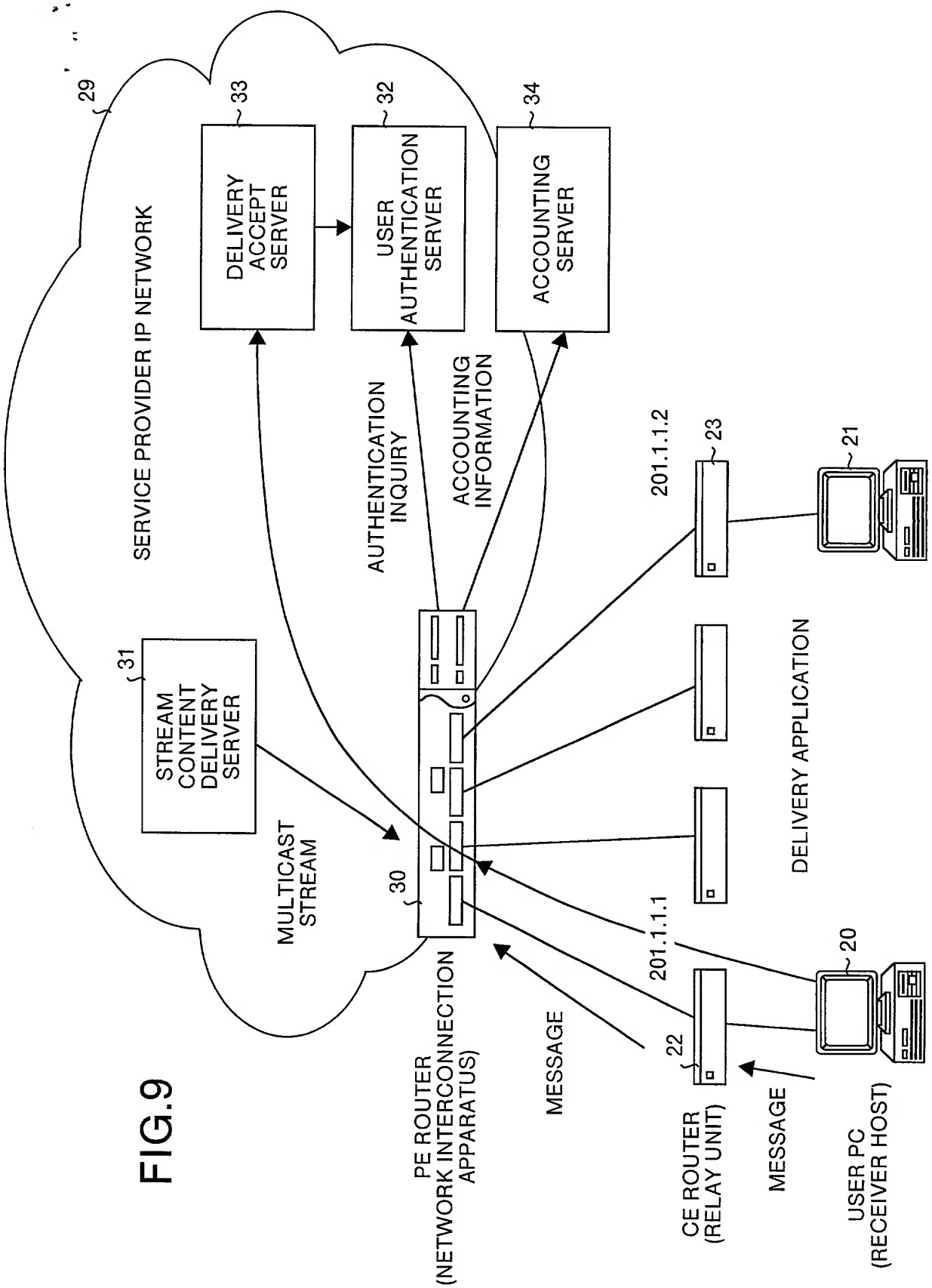

29
SERVICE PROVIDER IP NETWORK
33
DELIVERY ACCEPT SERVER
32
USER AUTHENTICATION SERVER
34
ACCOUNTING SERVER
31
STREAM CONTENT DELIVERY SERVER
MULTICAST STREAM
AUTHENTICATION INQUIRY
ACCOUNTING INFORMATION
30
201.1.1.1
201.1.1.2
23
21
DELIVERY APPLICATION
PE ROUTER (NETWORK INTERCONNECTION APPARATUS)
MESSAGE
22
CE ROUTER (RELAY UNIT)
MESSAGE
20
USER PC (RECEIVER HOST)

FIG.9

FIG.10

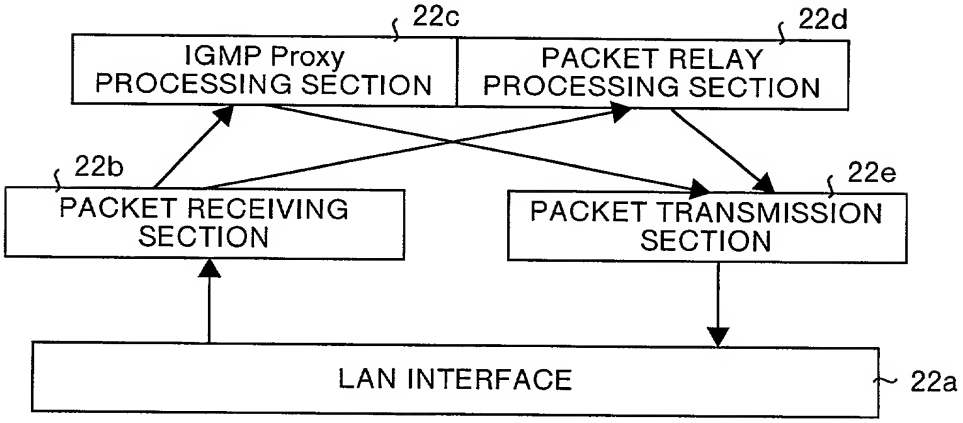

22c
IGMP Proxy PROCESSING SECTION
22d
PACKET RELAY PROCESSING SECTION
22b
PACKET RECEIVING SECTION
22e
PACKET TRANSMISSION SECTION
LAN INTERFACE
22a

FIG.11

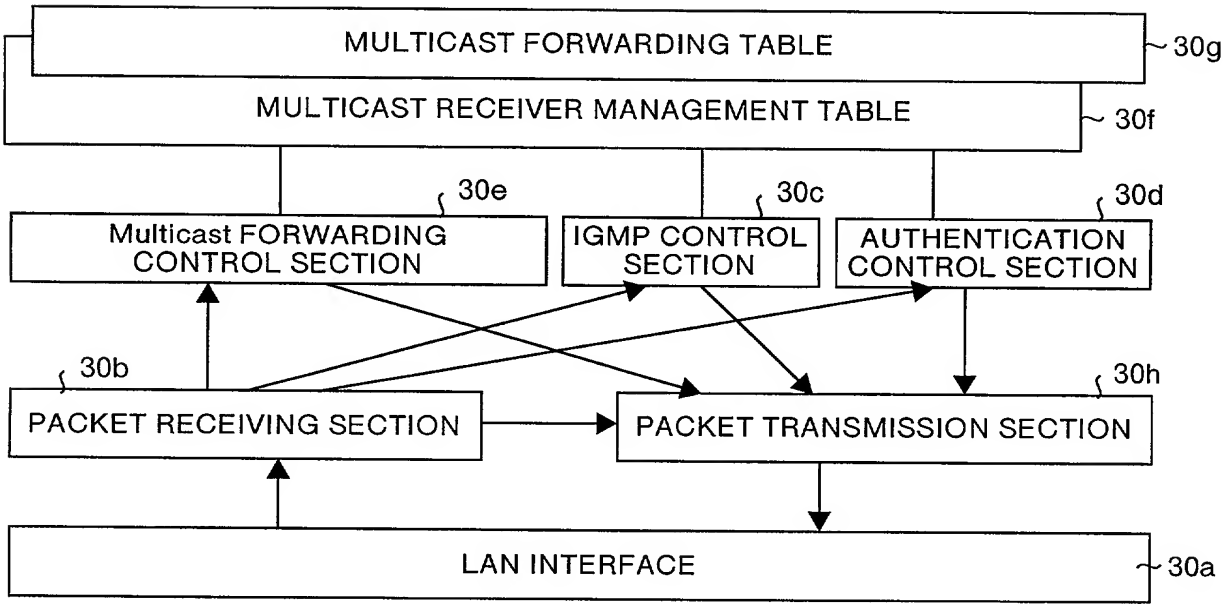

MULTICAST FORWARDING TABLE
30g
MULTICAST RECEIVER MANAGEMENT TABLE
30f
30e
Multicast FORWARDING CONTROL SECTION
30c
IGMP CONTROL SECTION
30d
AUTHENTICATION CONTROL SECTION
30b
PACKET RECEIVING SECTION
30h
PACKET TRANSMISSION SECTION
LAN INTERFACE
30a

FIG.12

MULTICAST RECEIVER MANAGEMENT TABLE

GROUP ADDRESS	RECEIVER IP ADDRESS	RECEIVER PORT NUMBER	SENDER PORT NUMBER
224.1.1.1	201.1.1.1 (192.52.150.1)	1	15
224.1.1.2	201.1.1.2 (192.52.122.1)	2	16

FIG.13

MULTICAST FORWARDING TABLE

GROUP ADDRESS	RECEIVER PORT NUMBER LIST
224.1.1.1	1,3,4,6, ...
224.1.1.2	2,3,5,8, ...

FIG.14

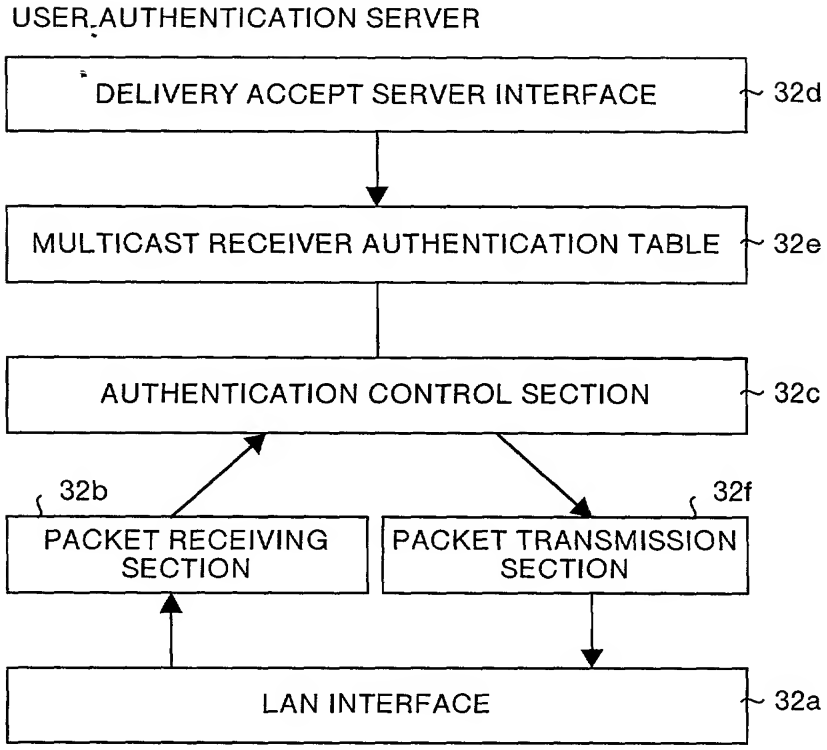

USER AUTHENTICATION SERVER
DELIVERY ACCEPT SERVER INTERFACE
32d
MULTICAST RECEIVER AUTHENTICATION TABLE
32e
AUTHENTICATION CONTROL SECTION
32c
32b
32f
PACKET RECEIVING SECTION
PACKET TRANSMISSION SECTION
LAN INTERFACE
32a

FIG.15

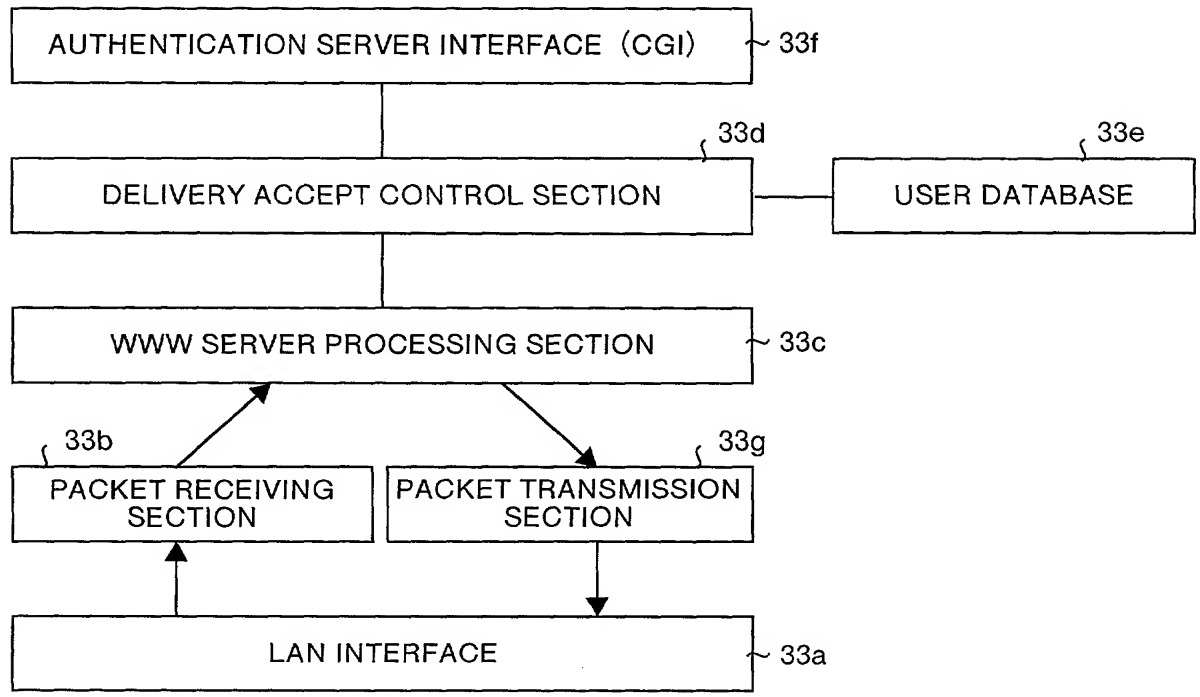

DELIVERY ACCEPT SERVER
AUTHENTICATION SERVER INTERFACE (CGI)
33f
33d
33e
DELIVERY ACCEPT CONTROL SECTION
USER DATABASE
WWW SERVER PROCESSING SECTION
33c
33b
33g
PACKET RECEIVING SECTION
PACKET TRANSMISSION SECTION
LAN INTERFACE
33a

FIG.16

DELIVERY RECEIVING SERVER DATABASE

USER ACCOUNT NAME	USER PASSWORD	RECEIVER IP ADDRESS	PE ROUTER IP ADDRESS	PE ROUTER PORT NUMBER
Tokyo	t2skf21er4	192.52.150.1	220.0.0.1	1
Oosaka	udfj49t8f	192.52.122.1	220.0.0.2	6

FIG.17

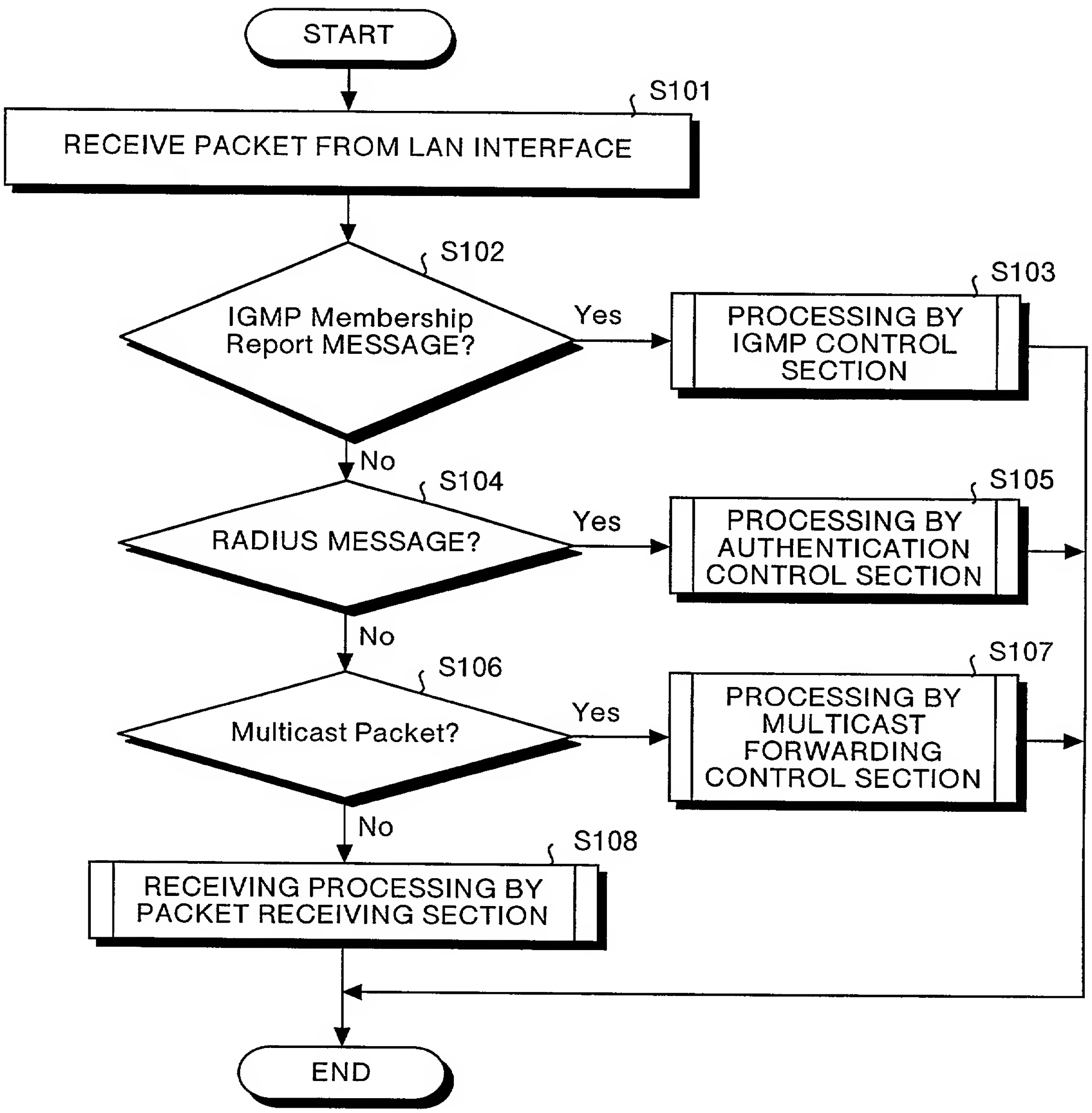

START
S101
RECEIVE PACKET FROM LAN INTERFACE
S102
IGMP Membership Report MESSAGE?
Yes
No
S103
PROCESSING BY IGMP CONTROL SECTION
S104
RADIUS MESSAGE?
Yes
No
S105
PROCESSING BY AUTHENTICATION CONTROL SECTION
S106
Multicast Packet?
Yes
No
S107
PROCESSING BY MULTICAST FORWARDING CONTROL SECTION
S108
RECEIVING PROCESSING BY PACKET RECEIVING SECTION
END

FIG.18

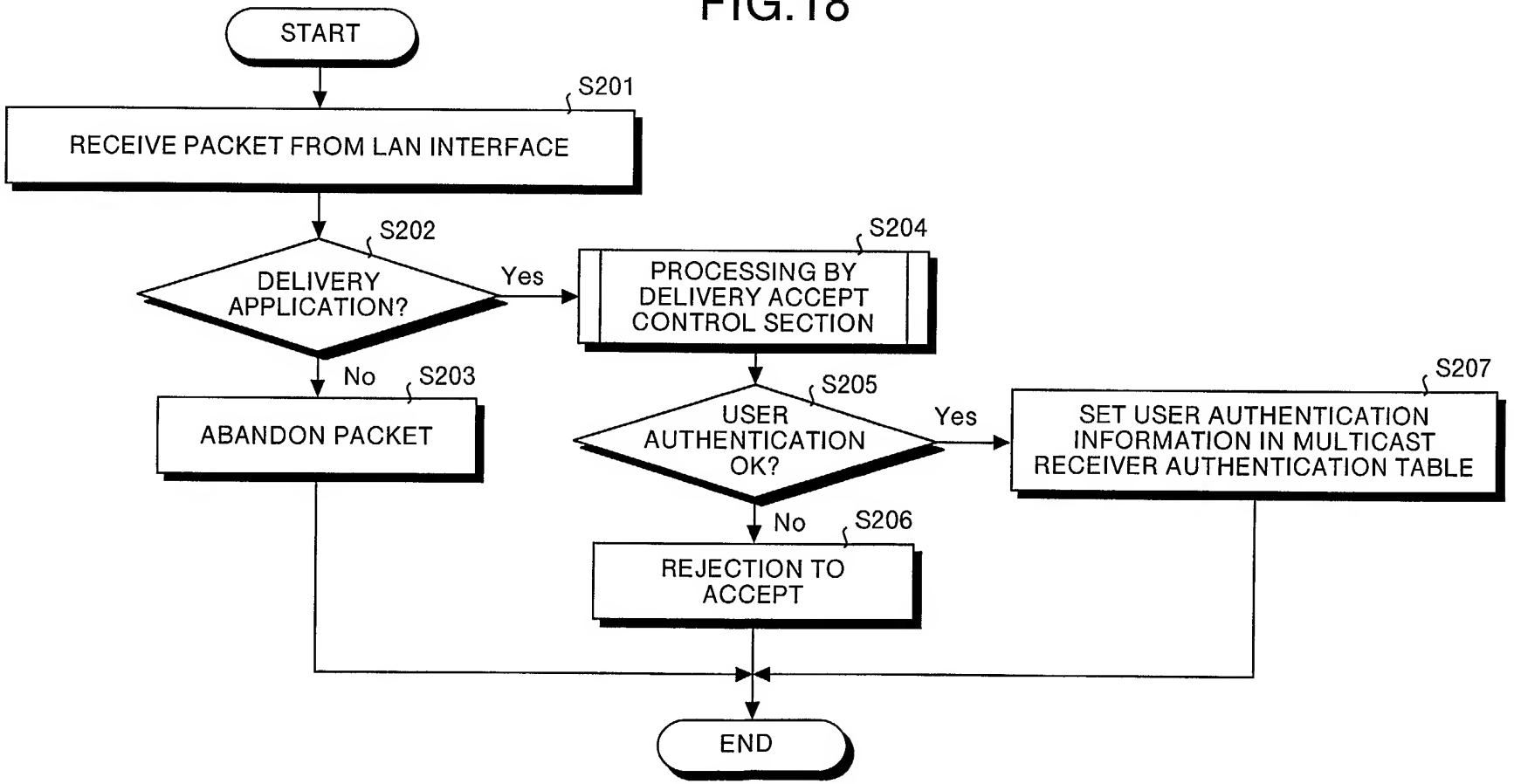


FIG.19

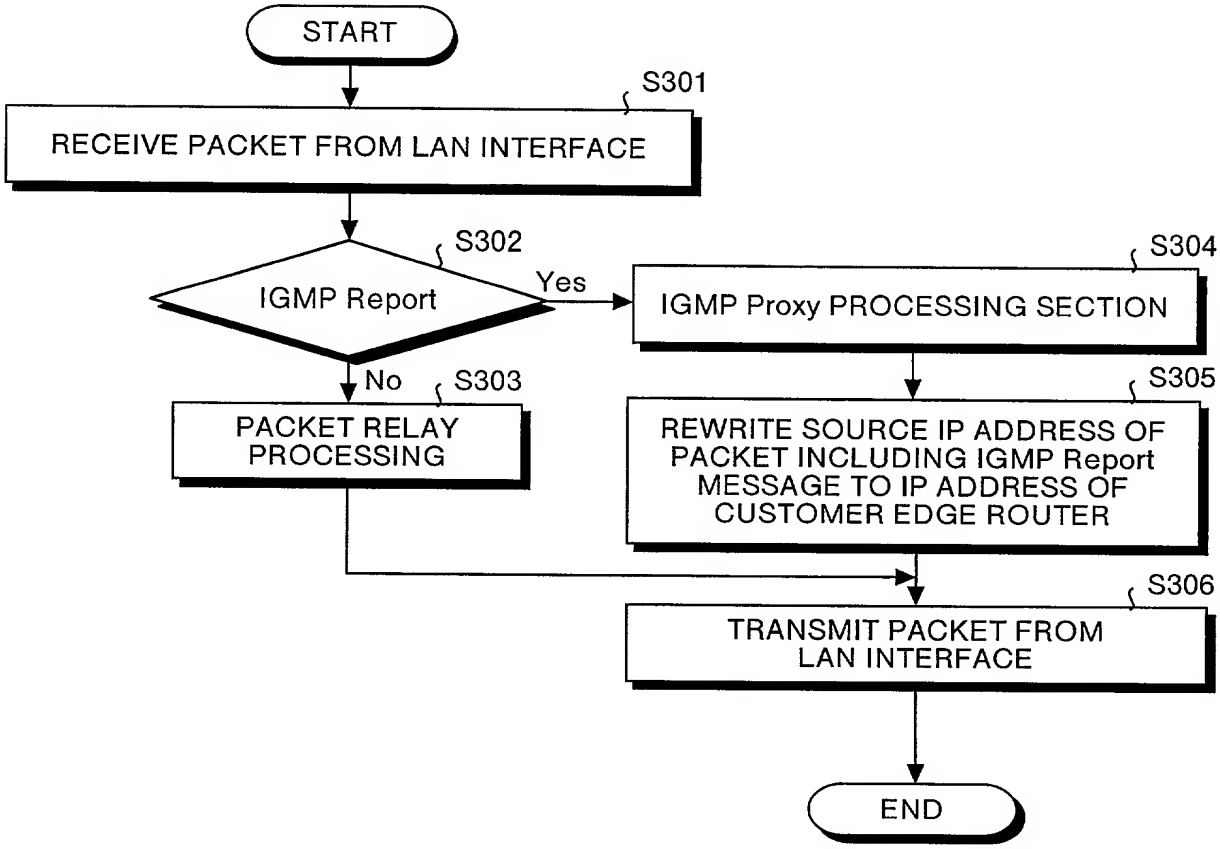

START
S301
RECEIVE PACKET FROM LAN INTERFACE
S302
IGMP Report
Yes
S304
IGMP Proxy PROCESSING SECTION
No
S303
PACKET RELAY PROCESSING
S305
REWRITE SOURCE IP ADDRESS OF PACKET INCLUDING IGMP Report MESSAGE TO IP ADDRESS OF CUSTOMER EDGE ROUTER
S306
TRANSMIT PACKET FROM LAN INTERFACE
END

FIG.20

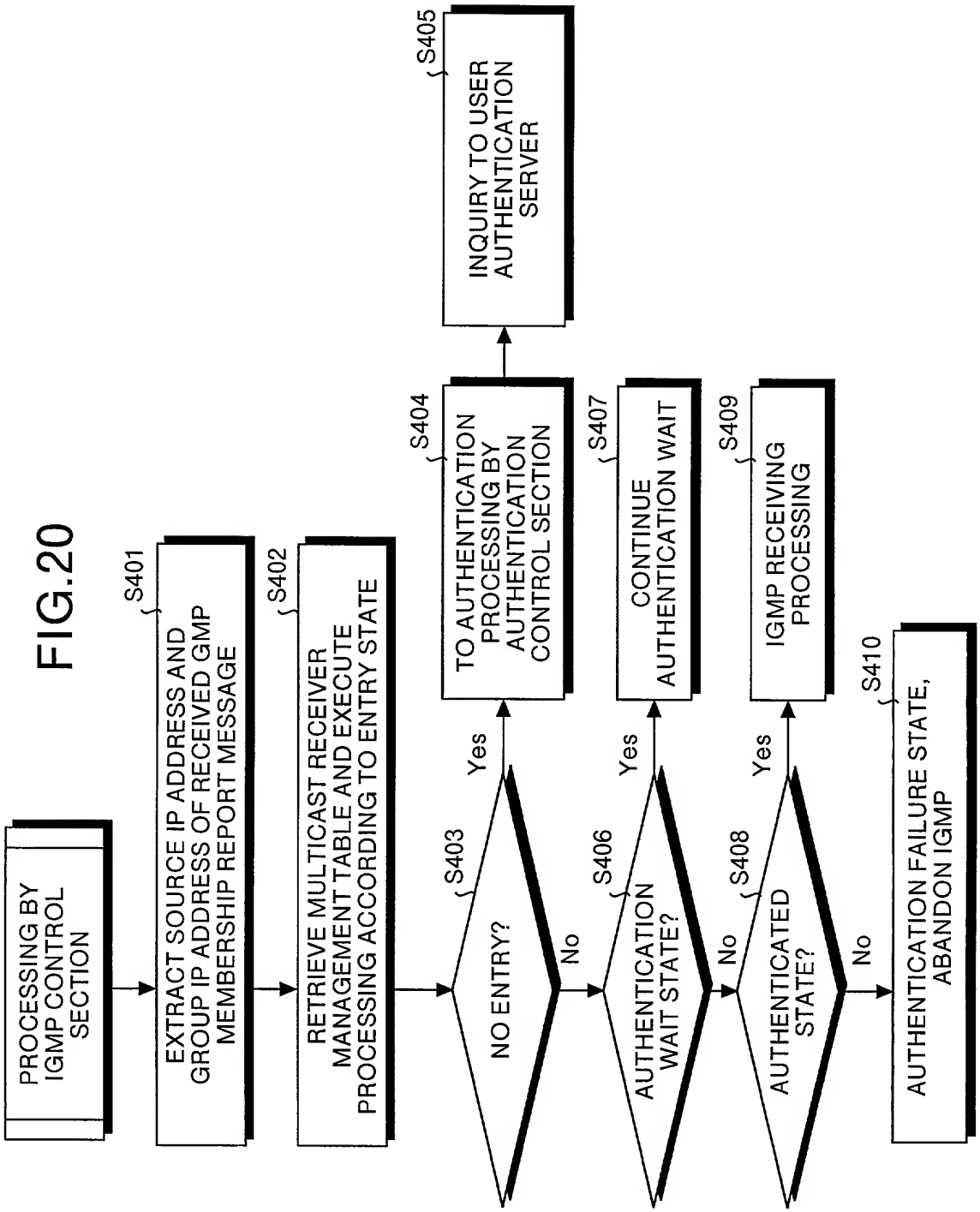

PROCESSING BY IGMP CONTROL SECTION
S401
EXTRACT SOURCE IP ADDRESS AND GROUP IP ADDRESS OF RECEIVED GMP MEMBERSHIP REPORT MESSAGE
S402
RETRIEVE MULTICAST RECEIVER MANAGEMENT TABLE AND EXECUTE PROCESSING ACCORDING TO ENTRY STATE
S403
NO ENTRY?
Yes
No
S404
TO AUTHENTICATION PROCESSING BY AUTHENTICATION CONTROL SECTION
S405
INQUIRY TO USER AUTHENTICATION SERVER
S406
AUTHENTICATION WAIT STATE?
Yes
No
S407
CONTINUE AUTHENTICATION WAIT
S408
AUTHENTICATED STATE?
Yes
No
S409
IGMP RECEIVING PROCESSING
S410
AUTHENTICATION FAILURE STATE, ABANDON IGMP

FIG.21

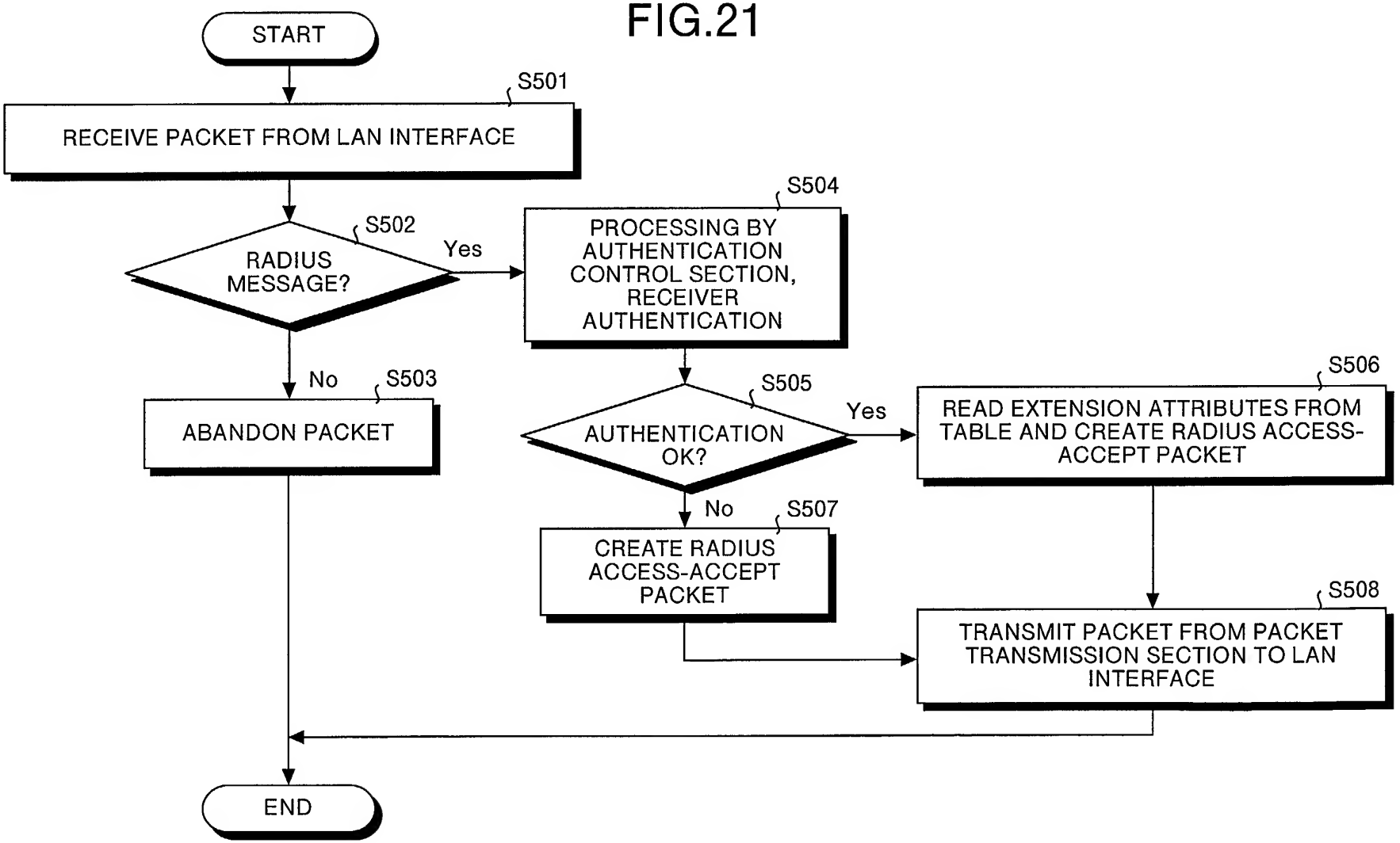


FIG.22

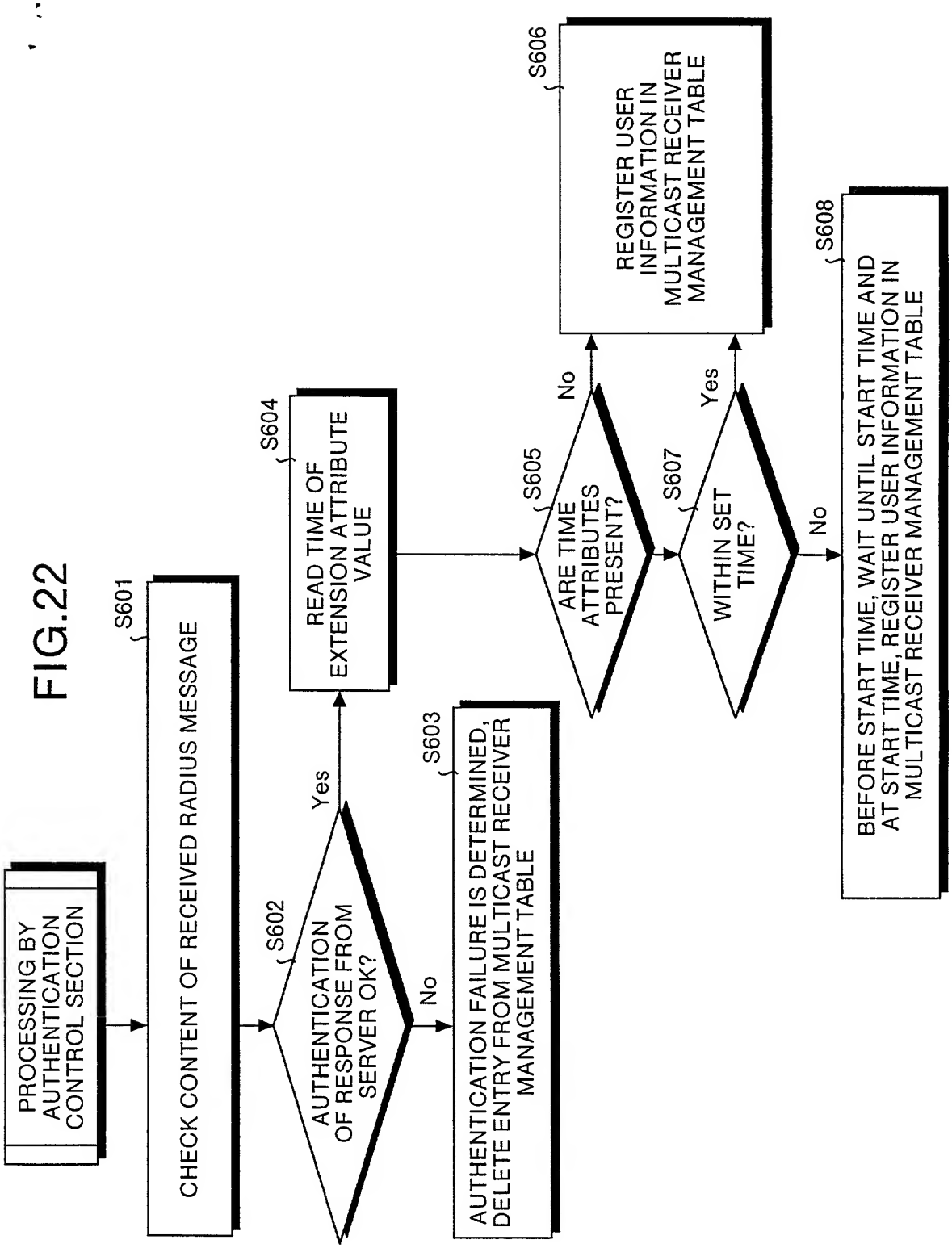

PROCESSING BY AUTHENTICATION CONTROL SECTION
S601
CHECK CONTENT OF RECEIVED RADIUS MESSAGE
S602
AUTHENTICATION OF RESPONSE FROM SERVER OK?
Yes
No
S603
AUTHENTICATION FAILURE IS DETERMINED, DELETE ENTRY FROM MULTICAST RECEIVER MANAGEMENT TABLE
S604
READ TIME OF EXTENSION ATTRIBUTE VALUE
S605
ARE TIME ATTRIBUTES PRESENT?
No
Yes
S606
REGISTER USER INFORMATION IN MULTICAST RECEIVER MANAGEMENT TABLE
S607
WITHIN SET TIME?
Yes
No
S608
BEFORE START TIME, WAIT UNTIL START TIME AND AT START TIME, REGISTER USER INFORMATION IN MULTICAST RECEIVER MANAGEMENT TABLE

FIG.23

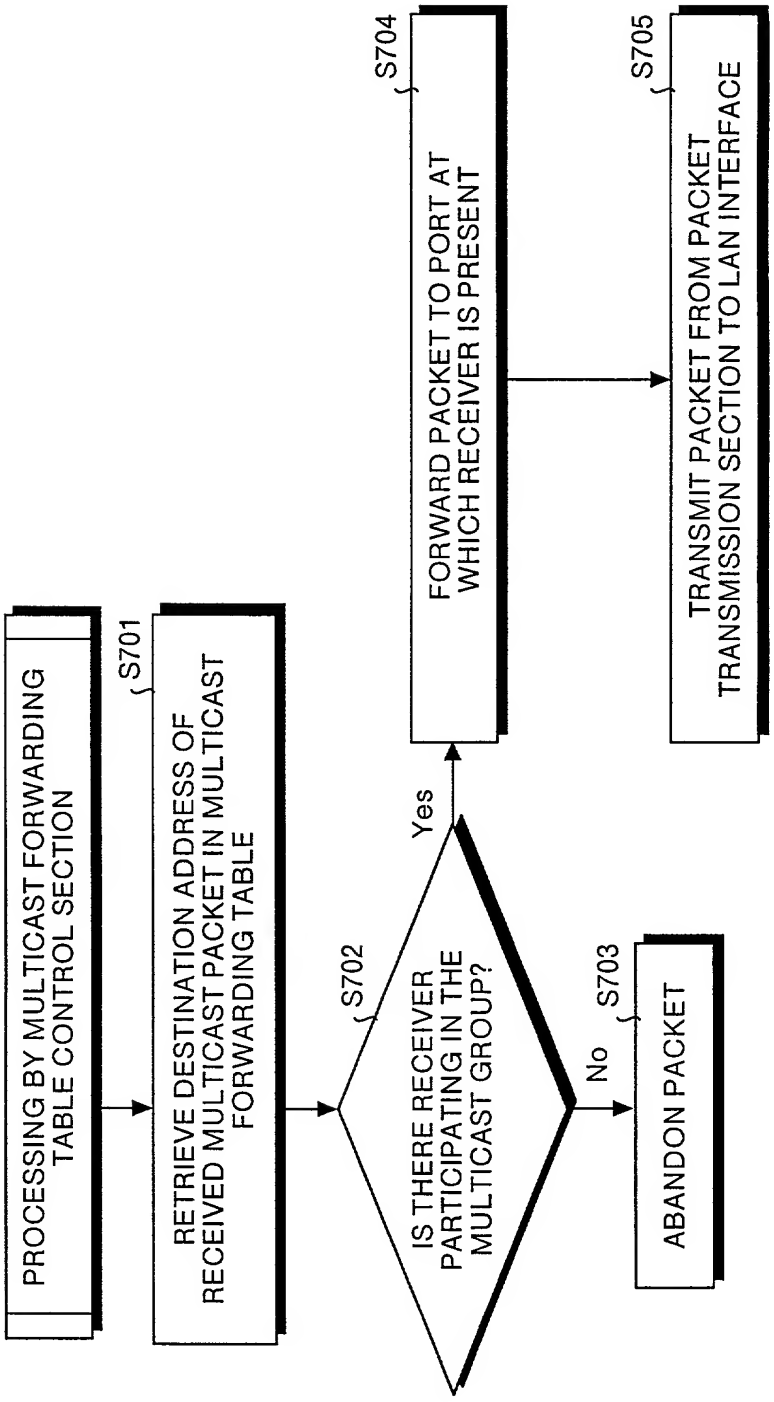

PROCESSING BY MULTICAST FORWARDING TABLE CONTROL SECTION
S701
RETRIEVE DESTINATION ADDRESS OF RECEIVED MULTICAST PACKET IN MULTICAST FORWARDING TABLE
S702
IS THERE RECEIVER PARTICIPATING IN THE MULTICAST GROUP?
Yes
No
S703
ABANDON PACKET
S704
FORWARD PACKET TO PORT AT WHICH RECEIVER IS PRESENT
S705
TRANSMIT PACKET FROM PACKET TRANSMISSION SECTION TO LAN INTERFACE

FIG.24

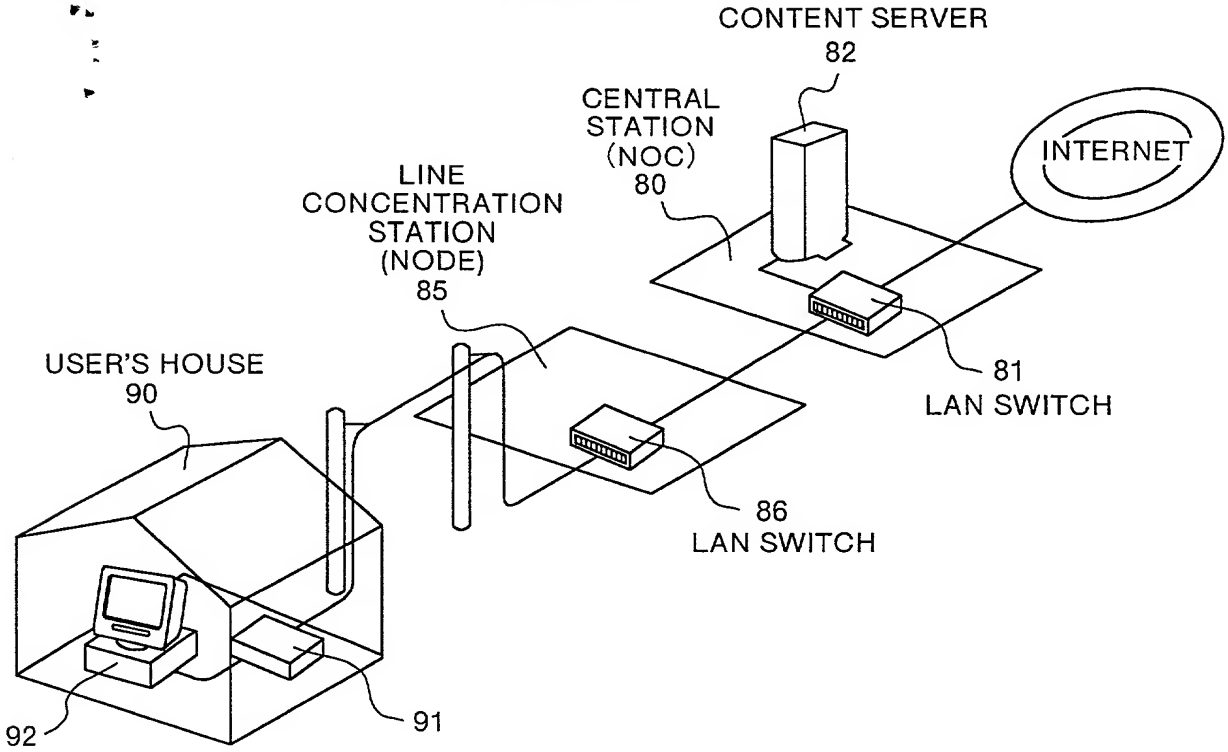
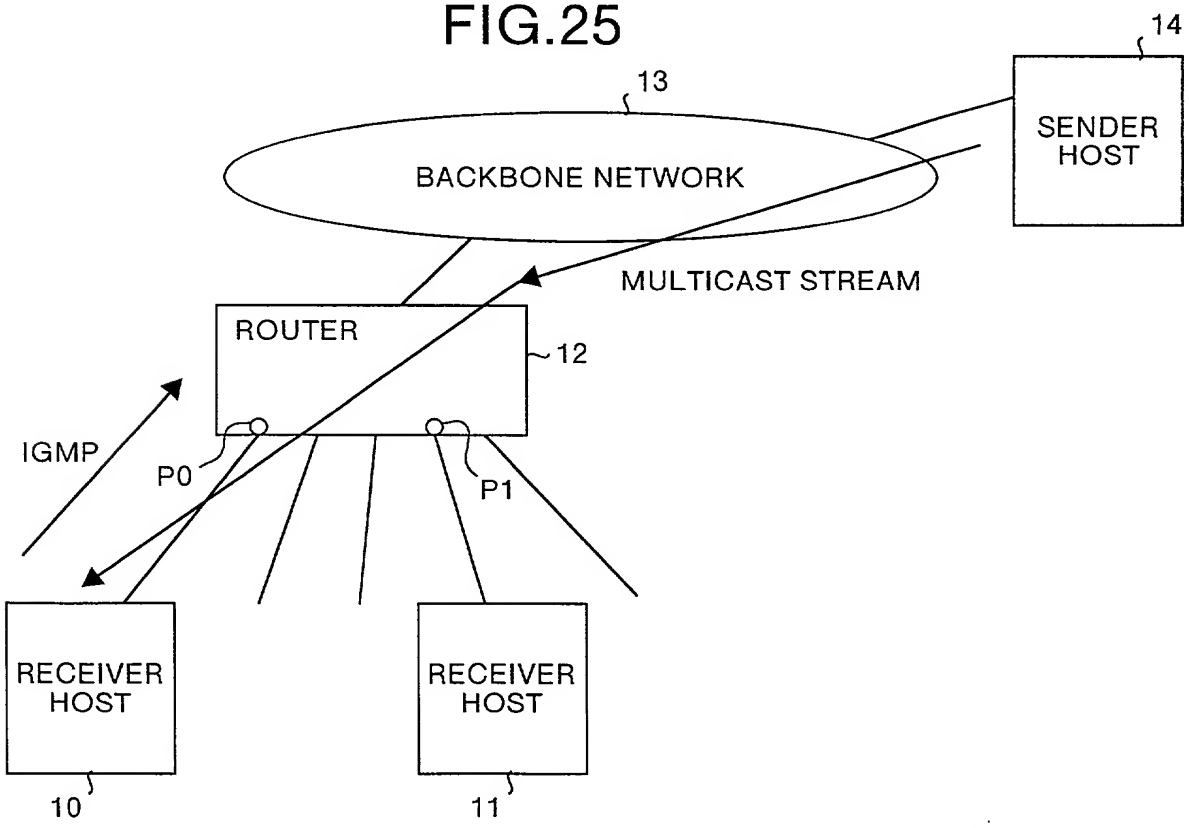

CONTENT SERVER
82
CENTRAL STATION (NOC)
80
INTERNET
LINE CONCENTRATION STATION (NODE)
85
USER'S HOUSE
90
81
LAN SWITCH
86
LAN SWITCH
92
91

FIG.25


14
13
SENDER HOST
BACKBONE NETWORK
MULTICAST STREAM
ROUTER
12
IGMP
P0
P1
RECEIVER HOST
RECEIVER HOST
10
11